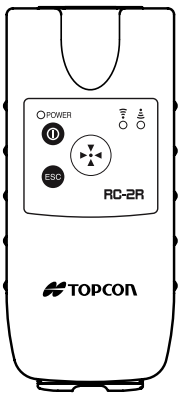
TOPCON



INSTRUCTION MANUAL
REMOTE CONTROL SYSTEM 2

RC-2

Japan Surveying Instruments JSIMA Manufacturers Association

Foreword

Thank you for purchasing the Topcon RC-2 Remote control system-2.
For the best performance of the instrument, please read these brief instructions carefully, and keep them in a convenient location for future reference.

This system has the following features:
- Enables optical communications between the total station GTS-800A and RC-2R on the prism side, which allows simplified one-man survey based on the application programs.
- Has the turn-round function with which more efficient one-man survey is possible.

General Handling Precautions

Before starting work or operation, be sure to check that this system is functioning correctly with normal performance.
- Do not submerge the instrument into water.
  The instrument can not be submerged underwater.
  RC-2R is designed based on the International Standard IPX 5 and RC-2H is designed based on the International Standard IPX 4, therefore it is protected from the normal rainfall.
- Guarding the instrument against shocks.
  When transporting the instrument, provide some protection to minimize the risk of shocks. Heavy shocks may cause the measurement to be faulty.

- Battery level check.
  Confirm battery remaining level before operating.

- Storing the instrument for long period
  Remove the dry cells from the instrument when you would not use it for long period.

- Turn-round motions and Optical communications
  RC-2R should be kept aiming so that the total station always stays within the above range of laser beam emission until the turn-round motions or optical communications are completed. If the aiming is out of above range while RC-2R is in turn-round motions or optical communications, the turn-round or optical communications could not be completed.
  See “Light emitting angle” on page 14 and “Light detecting range” on page 15.

Safety Information

In order to encourage the safe use of products and prevent any danger to the operator and others or damage to properties, important warnings are put on the products and inserted in the instruction manuals.
We suggest that everyone understand the meaning of the following displays and icons before reading the “Safety Cautions” and text.

Display	Meaning
WARNING	Ignoring or disregard of this display may lead to death or serious injury.
CAUTION	Ignoring or disregard of this display may lead to personal injury or physical damage to the instrument.

Injury refers to hurt, burn, electric shock, etc.
Physical damage refers to extensive damage to buildings or equipment and furniture.

Safety Cautions

WARNING
• **There is a risk of fire, electric shock or physical harm if you attempt to disassemble or repair the instrument yourself.** This is only to be carried out by TOPCON or an authorized dealer, only!
• **Risk of fire or electric shock**. Do not use damaged power cable, plug and socket.
• **Risk of fire or electric shock.** Do not use a wet battery or charger.
• **May ignite explosively.** Never use an instrument near flammable gas, liquid matter, and do not use in a coal mine.
• **Battery can cause explosion or injury.** Do not dispose in fire or heat.
• **The short circuit of a battery can cause a fire.** Do not short circuit battery when storing it.

CAUTION
Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.
Do not allow skin or clothing to come into contact with acid from the batteries, if this does occur then wash off with copious amounts of water and seek medical advice.
Risk of injury by falling down the instrument or case. Do not use a carrying case with a damaged which belts, grips or latches.
It could be dangerous if the instrument falls over, please check that you fix the handle to the instrument.

User

1) This product is for professional use only!
   The user is required to be a qualified surveyor or have a good knowledge of surveying, in order to understand the user and safety instructions, before operating, inspecting or adjusting.
2) Wear the required protectors (safety shoes, helmet, etc.) when operating.

Exceptions from Responsibility

1) The user of this product is expected to follow all operating instructions and make periodic checks of the product's performance.
2) The manufacturer, or its representatives, assumes no responsibility for results of a faulty or intentional usage or misuse including any direct, indirect, consequential damage, and loss of profits.
3) The manufacturer, or its representatives, assumes no responsibility for consequential damage, and loss of profits by any disaster, (an earthquake, storms, floods etc.).
   A fire, accident, or an act of a third party and/or a usage any other usual conditions.
4) The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits due to a change of data, loss of data, an interruption of business etc., caused by using the product or an unusable product.
5) The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits caused by usage except for explained in the user manual.
6) The manufacturer, or its representatives, assumes no responsibility for damage caused by wrong movement, or action due to connecting with other products.

Laser Safety

This product uses the invisible lases beam to measure distance. This product is manufactured and sold in accordance with "Performance Standards for Light-Emitting Products" (FDA/BRH 21 CFR 1040) or "Radiation Safety of Laser Products, Equipment Classification, Requirements and User's Guide" (IEC Publication 825) provided on the safety standards for laser beam.
As per the said standard, this product is classified as "Class 1 (I) Laser Products".
This is simple a product to operating that is not required to training from a "Laser safety officer".
In case of any failure, do not disassemble the instrument. Contact TOPCON or your TOPCON dealer.

Class 1 Laser Product

Class 1 Laser Product

Total Station GTS-800A series

The software must be of the correct version for your version of the GTS-800A series, otherwise the RC-2R will not function properly. Contact TOPCON or your TOPCON dealer for version information.

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Standard System Components

1) Remote controller RC-2R	1pc.
2) Remote controller Handle unit RC-2H	1pc.
3) AA size dry cells	4pcs.
4) Silicon cloth	1pc.
5) Instruction manual	1vol.

Please make sure that all of above items are in the box when you unpack.

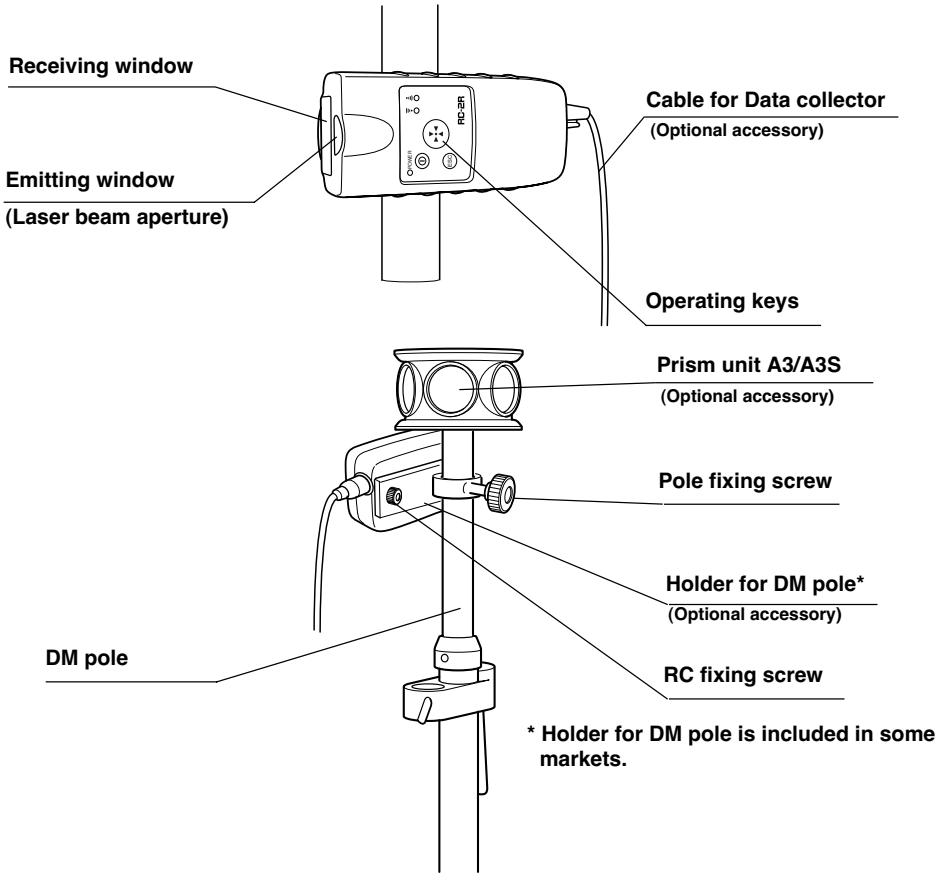
- Either of the following sets is included in some market.

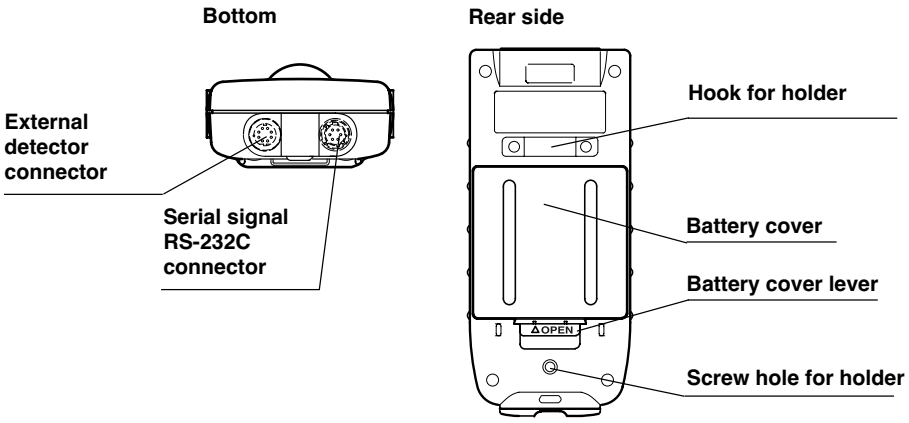
• Holder for DM pole	1pc.
• Holder for prism unit A3/A3S	1pc.

• Holder for DM pole	1pc.
• External detector	1pc.

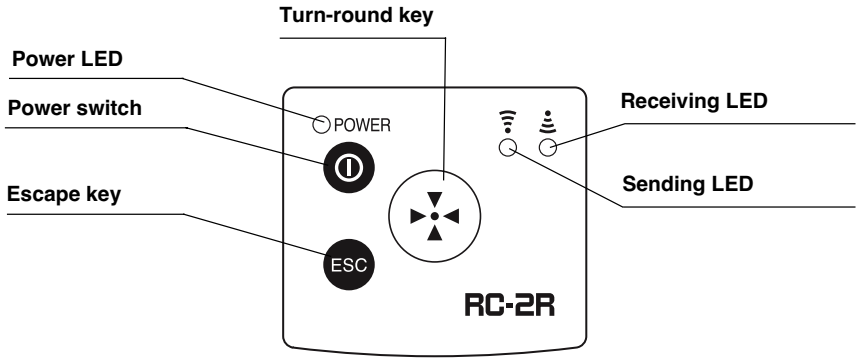
NOMENCLATURE and FUNCTIONS

Remote Controller RC-2R





Panel



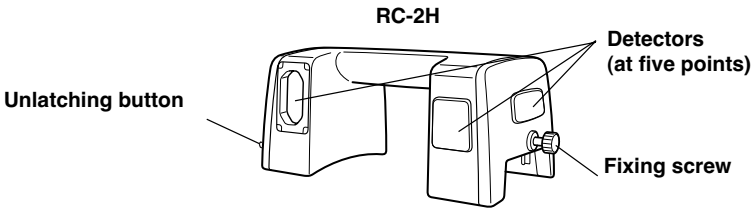
Key	Function
Power switch	ON/OFF of power of the RC-2R.
Turn-round motion key	Total station will be in turn-round motion.
Escape key	Cancels the turn-round motion.

LEDs

LED	Status	Contents
Power LED	**On solid**	The power of RC-2R is ON.
	Flash	The battery remaining of RC-2R is low. Replace the batteries with new ones.
	Off	The power is OFF
Receiving LED	**On solid**	RC-2R is in the middle of data reception.
Sending LED	**On solid**	RC-2R is in the middle of data transmission.
	Flash	RC-2R is in the middle of turn-round command transmission.

Remote Controller Handle Unit RC-2H

GTS-800A series total station requires RC-2H to enable turn-round motions and optical communications with RC-2R.



GTS-800A series carrying case is large enough to house GTS-800A series total station fitted with RC-2H

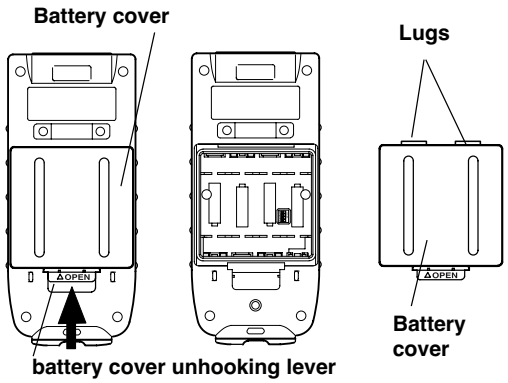
Preparation

Battery installation and replacement

1 Push up the battery cover unhooking lever and detach the cover.

2 Install four new “AA” size dry cells with correct polar orientation as shown on the side of the battery housing.

3 Insert the top lugs of battery cover and press the cover until it is snapped shut.



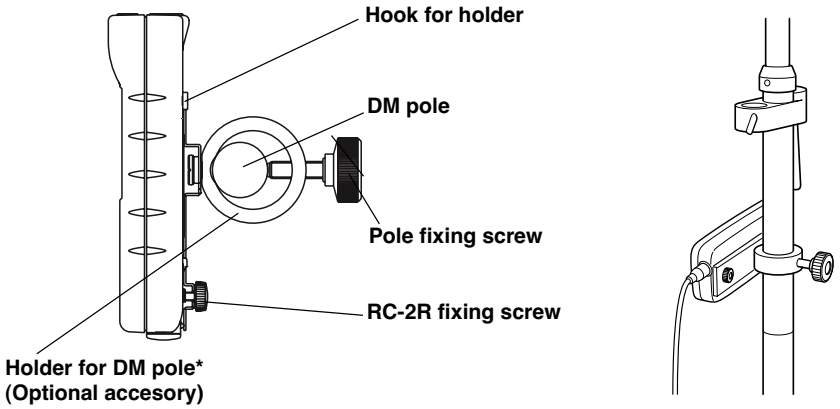
Note	● Replace all 4 batteries with new ones. ● Do not mix used and new batteries, and do not mix different types of batteries together. ● Insert the batteries with the positive and negative terminals oriented correctly.

Installing RC-2R onto the DM pole

RC-2R can be installed onto the DM pole as shown below:.

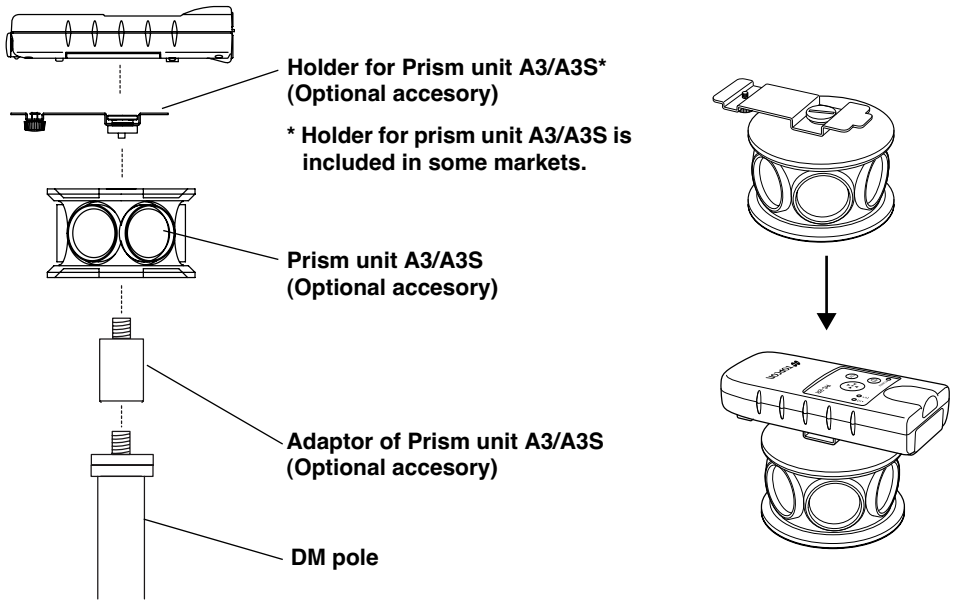
1 Insert the DM pole into the holder and secure the holder by fastening the pole fixing screw.

2 Hook the RC-2R to the hook of the holder and tighten the RC-2R fixing screw of the holder.

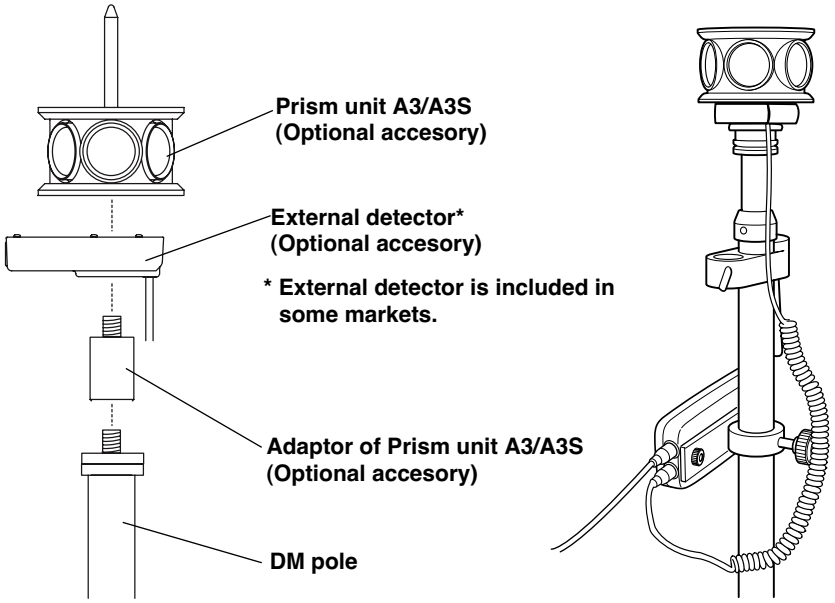


*** Holder for DM pole is included in some markets.**

Installing RC-2R onto the prism unit A2/A2S



Installing external detector and prism ontot he DM pole



Prism

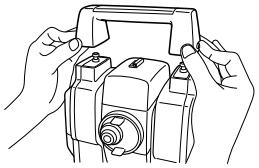
Refer to “System / Prism System” on page 20 and “Special Accessories” on page 21 for further information.

Note	● When you do not use the external detector, the minimum distance for optical communications will differ by the position of the prism. Refer to “Minimum Distance for Optical Communication” on page 18.

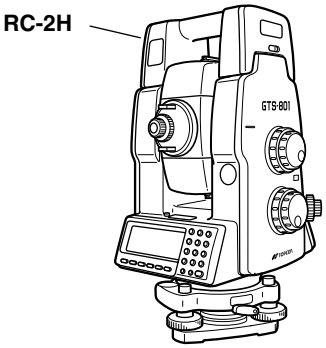
Installing remote controller handle unit RC-2H onto the total station

Optical communications between GTS-800A series total station and RC-2R, become possible by installing remote controller handle unit RC-2H onto the total station.

1 Dismount the handle from GTS-800A series total station.



2 Mount RC-2H and secure it firmly with the fixing

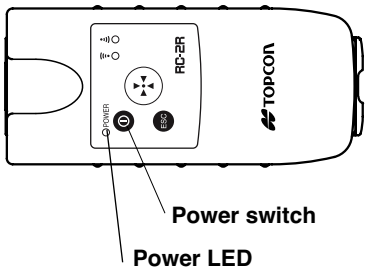


Note	● Ensure that the power switch of total station is off when installing RC-2H.

Basic Operation

Power switch ON

1 Press the power switch.
Power LED will light.



Battery Remaining Display for RC-2R

When the battery of the RC-2R is low, the power LED will flash with beep sound.
(Audio sound: Two pitches, frequent beep synchronized with power LED)
Confirm the battery remaining when turning on the instrument.
When the LED is displayed and the beep sounds, replace the dry batteries with new ones.
We recommend for safety to prepare spare dry batteries.

Battery Warning for GTS-800A series

When the battery power of total station GTS-800A series in optical communication with RC-2R is low, the bip will sound from the RC-2R.
(Audio sound: Three pitches, frequent bip)
When the bip sounds, replace or recharge the batteries of GTS-800A series.

Auto Power Off

If no key operation is given or no communication is performed for more than 30 minutes, the power turns off automatically.

Error display

The RC-2R unit does not display errors.
Refer to the operation manual for the data collector and other software for details.

Setting for Optical communications with GTS-800A series

The following settings and conditions are prerequisites for the optical communications to take place between the total station (or a application program) and RC-2.

When communications are processed directly by the total station and the data collector connected to RC-2R, the following settings and conditions are prerequisites.

Setting parameters in GTS-800A Series

1 Set parameters in the Parameters Setting Mode. (Refer to Table of item to be set shown as follows.)
Operation
Main menu - Parameters Setting Modes [F6](Para) - [F2](communication) - [F1](Serial Port RS-232C / RC-1,RC-2)

2 Select Communication Path to RC-1,2 in the program [EXT.LINK] .
Operation
Main menu - Program Modes [F1](Prog) - [F2](EXT.LINK) - [F2](Setting) - [F1](CABLE / RADIO MODEM / RC-1,RC-2)

3 Set Parameter for RC-1,RC-2.
Operation
Main menu - Program Modes [F1](Prog) - [F2](EXT.LINK) - [F2](Setting) - [F3](RC-1,RC-2)

4 Execute the External Link.
Operation
Main menu - Program Modes [F1](Prog) - [F2](EXT.LINK) - [F1](Execute)

Setting parameters in GTS-800A Series

1 Set the parameters in Setting Mode.
Refer to Table of item to be set in Setting Mode.

2 Connect a data collector to be used to the serial RS-232C connector of the RC-2R, and set the items as follows.

B.Rate	4800
Data.L	8
Parity	none
Stop Bit	1

Table of item to be set

Following parameters surrounded that you must set for RC-2R and GTS-800A series.

Setting Parameters in GTS-800A series

- Main menu- Program mode [F1](Prog)- [F2](EXT.LINK)- [F2](Setting)

(1) CABLE / RADIO MODEM/ RC-1, RC-2 (Setting of communication path)

CABLE / RADIO MODEM/ RC-1	O

(2) PARAMETER RC-1,RC-2

Channel	O
Retry	O
Delimiter (Terminate)	O
REC TYPE	O

Main menu- Parameters Setting mode [F6](Para)- [F2](Communication)- [F3](Set RC-1, RC-2)

In this setting, [V.Search] and [RC-1R, 2R] are only items for setting. Other parameters must be set in above " (2) PARAMETER RC-1, RC-2" setting.

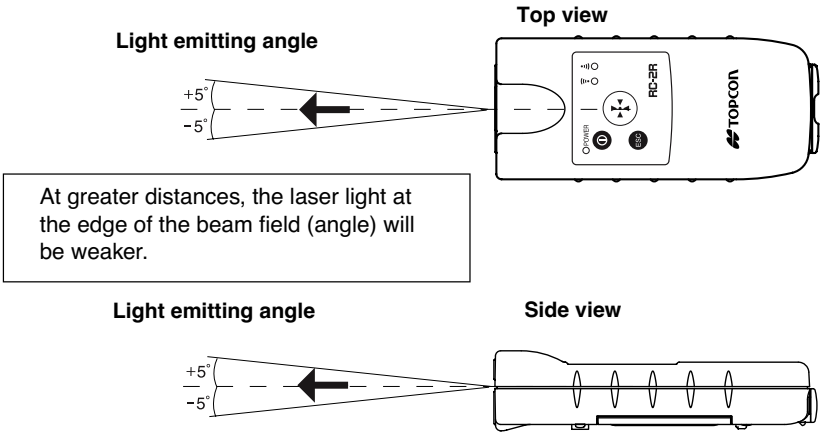
Channel	-------
V.Search	O
RC-1R, 2R	O
Retry	-------
Delimit	-------
REC-A/B	-------
NEZ-REC	-------
Trk State	-------

Setting Parameters in RC-2R

Communication channel	O

Light emitting angle

Laser beams are emitted from the light emitter of the RC-2R.
The angle of emitting laser beams is as follows.

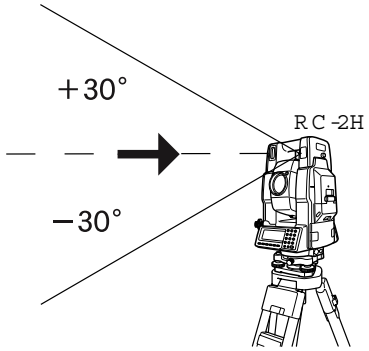


Important	● RC-2R should be kept aiming so that the total station always stays within the above range of laser beam emission until the turn-round motions or optical communications are completed. If the aiming is out of above range while RC-2R is in turn-round motions or optical communications, the turn-round or optical communications could not be completed.

Light detecting range

The detecting angles of RC-2R and RC-2H (Total station) are shown below:
Total station can only be turned round with the turn-round key under the condition that RC-2R remains confined within the range as shown below where RC-2H can detect light.
RC-2R should be aimed in a way to always capture the total station within this range during receiving data from the total station.

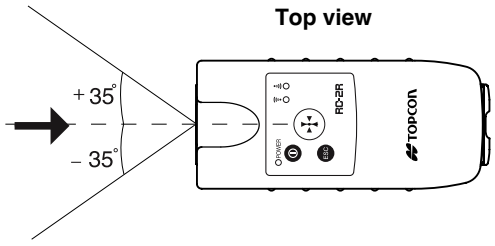
Detecting range
(RC-2H can detect the laser in all horizontal direction.)



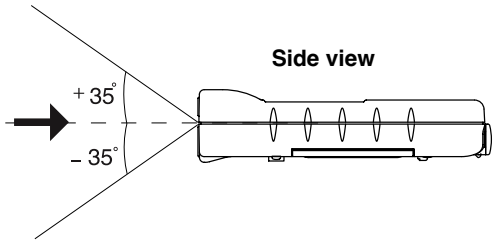
Turn-round function can be done within above range.

Detecting range

Top view



Side view



Important	● The RC-2R must be aimed so as to capture the total station within above range during communicating.

Turn-round function

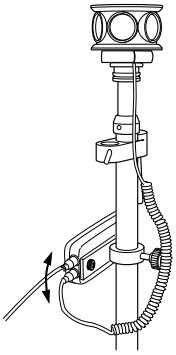
Important	● RC-2R should be kept aiming so that the total station always stays within the above range of laser beam emission until the turn-round motions is completed. If the aiming is out of above range while RC-2R is in turn-round motions, the turn-round could not be completed. ● At greater distances, the laser light at the edge of the emitting range (angle) will be weaker; therefore, the RC-2R must be aimed correctly.

The turn-round key on RC-2R is used to have the total station search or automatically track RC-2R (prism).
In the auto tracking mode, RC-2R and the total station are ready for optical communications.
Turn-round function is useful for auto-tracking when you start working or when the auto-tracking is interrupted by any reason.
For increasing efficiency, keep the auto-tracking status when you move to another measurement point.

Note	● The settings and conditions of communication are prerequisites for the optical communications to take place between the total station and RC-2.

1 Turn on the total station and execute the [External Link].

2 Aim the RC-2R light emitter at the total station.



3 Turn On the RC-2R by pressing the power switch.

4 Press the [turn-round] key on RC-2R.
Total station starts searching and ends in the tracking mode where it is communicable with this system.

Note	● Total station must be kept apart from reflecting planes such as glass and white walls. Reflected light may prevent it from correct prism searching and from auto tracking. In this case, change the power mode of RC-2R to the low power mode to decrease the output of laser beam. To change the power mode, see “Low Power mode of Laser Beam” on page 17. ● Ensure that RC-2R remains as motionless as possible when the total station is in turn-round motions. Total station otherwise may not be able to search prism correctly, requiring extra time for the task. ● The RC-2R must be aimed so as to capture the total station within a range of ± 35° in the vertical and horizontal direction during communicating. (Refer to “Light detecting range” section.)

Stopping turn-around operations

Press the [ESC] key to terminate turn-around operation. After the key is pressed, turn-around operation will continue for a short time before the Total Station comes to a stop.

Tracking Sensitivity of GTS-800A Series

When executing turn-around operations at separation distances of 100 m or more from the GTS-800A series, the manufacturer recommends setting the tracking sensitivity of the GTS-800A series to high (H) in order to make operations more consistent.
On the low (L) and medium (M) settings, distance and weather conditions can increase the time required for turn-around operations, and under certain adverse conditions GTS-800A series operations might even be impossible.

Low Power mode of Laser Beam

When the Total Station performs a turn-around function at a distance of approximately 10 m from the RC-2R, strong reflections of the pulsed laser diode (PLD) emission can prevent the Total Station from searching the prism correctly. In this case, switch the laser to low-power mode to reduce the intensity of such reflections.
In low-power mode, the range of the turn-round function is shorter than in normal-power mode.

To change the power mode

Turn the power ON while holding down the [ESC] key.
A buzzer will sound indicating that the RC-2R is in low-power mode.
To return to normal-power mode, turn the power OFF, wait several seconds, and then turn the power ON again.

Reference : Turn-round motions:

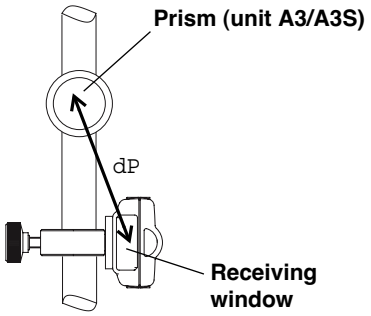
When the turn-around key on the RC-2R is pressed, the pulsed laser diode (PLD) in the emitter produces a laser beam with a ± 5° cone pattern (Refer to “Light emitting angle” on page 14”.)
The RC-2H component of the Total Station has photo detectors on all four sides (front, rear, right and left), allowing laser beams to be detected in any orientation. This detection ability extends to approximately ± 30° in the vertical direction (refer to “Light detecting range” on page 15.)
Upon detecting laser emissions, the Total Station aligns toward the RC-2R.
After horizontal alignment, the telescope is scanned vertically in order to target the prism and initiate auto tracking.

Under certain conditions, the time required for communications can increase to the point that turn-around operations require a long time to complete, and under certain circumstances such operations might not even be completed properly. The following conditions can adversely affect operation:

1) When units are used for communication over long distances or under poor atmospheric and weather conditions (e.g., in strong direct sunlight; heat refraction such as occurs near road surfaces and building surfaces on hot days; rain; fog, etc.)
2) When the aim of the RC-2R is set incorrectly (refer to “Light emitting angle” on page 14.)
3) When the installation position of the prism and RC-2R are separated (refer to “Minimum Distance for Optical Communication” on page 18.)
4) When the tracking sensitivity of the GTS-800A is set incorrectly (refer to “Tracking Sensitivity of GTS-800A Series” on page 17.)
5) When communication channel settings, or other settings, of the GTS-800A and RC-2R are not matched or are set incorrectly (refer to “Table of item to be set” on page 13 and “Setting Mode” on page 19.)
6) When the GTS-800A is located in front of or to the side of glass or some other reflective surface.
7) When, during turn-around operations, a person, car, or other object obstructs the light path between the GTS-800A and the RC-2R.
8) When the units are used over long distances, the RC-2R is set to low-power mode (“Low Power mode of Laser Beam” on page 17.)
9) When the dip switch settings on the RC-2R are set incorrectly (refer to “Setting Mode” on page 19.)
10) When the battery status display on the GTS-800A is flashing (low battery power)

Minimum Distance for Optical Communication

If you are not using the external detector, attach the prism unit as close as possible to the RC-2R. The minimum distance for optical communication is then determined by the distance between the prism and the receiving window (dP), as described below.



Minimum distance	Prism position (dP)
10m	within 15cm
20m	within 30cm
30m	within 45cm

Recommendation of the sealed-nickel-metal hydride (Ni-MH) battery

The use of Ni-MH batteries is recommended under low ambient temperature conditions. In general, under cold conditions, the discharge characteristics of Ni-MH batteries are better than those of alkaline-manganese batteries, thus providing longer operating time.

Setting Mode

In this mode, following items can be set.

Setting Items

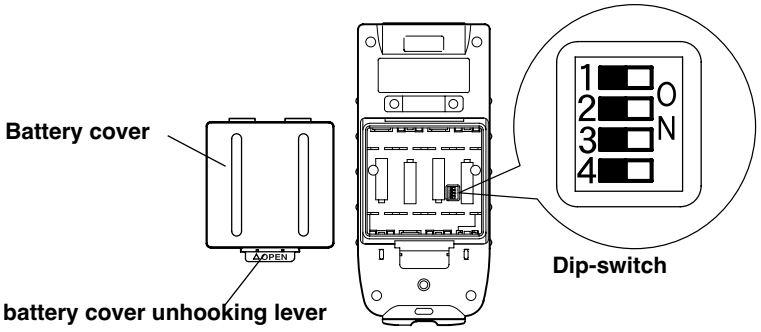
Items	Selecting item	Description
Communication channel	**1 to 3**	Sets a channel to be used for communications. The same communication channel must be assigned to both RC-2R and the total station. The turn-round function will work regardless of setting channel.
Communication type	**Normal / Turn-round only**	Select communication type. Normal: Normal communication Turn-round only: Turn-round function is only available but other communication can not be available.

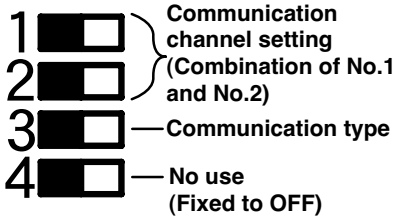
How to Set

Set the setting mode by using the dip-switch located in battery space.

1 Detach the battery cover and take off the dry batteries.

2 Turn the dip-switch ON or OFF using with a pin.



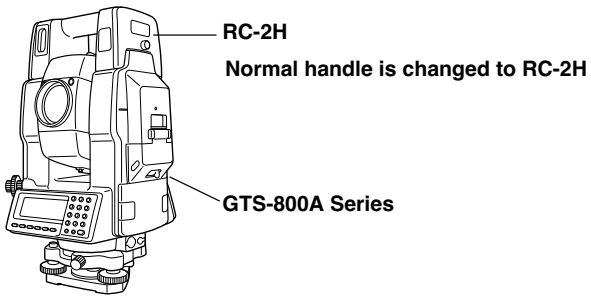


Dip-switch	Setting	Contents
1 2	1: OFF 2: OFF	Channel 1
	1: ON 2: OFF	Channel 2
	1: OFF 2: ON	Channel 3
3	OFF	Normal communication
	ON	Turn-round function is only available
4	No use (Fixed to OFF)	----------

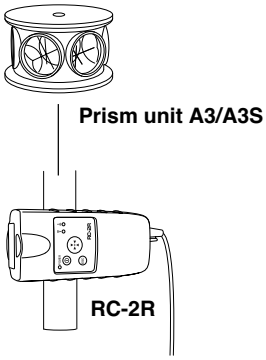
Notice	● Dip-switch No.4 must be fixed to OFF position. The RC-2R does not work correctly when the switch No.4 is set to ON position.

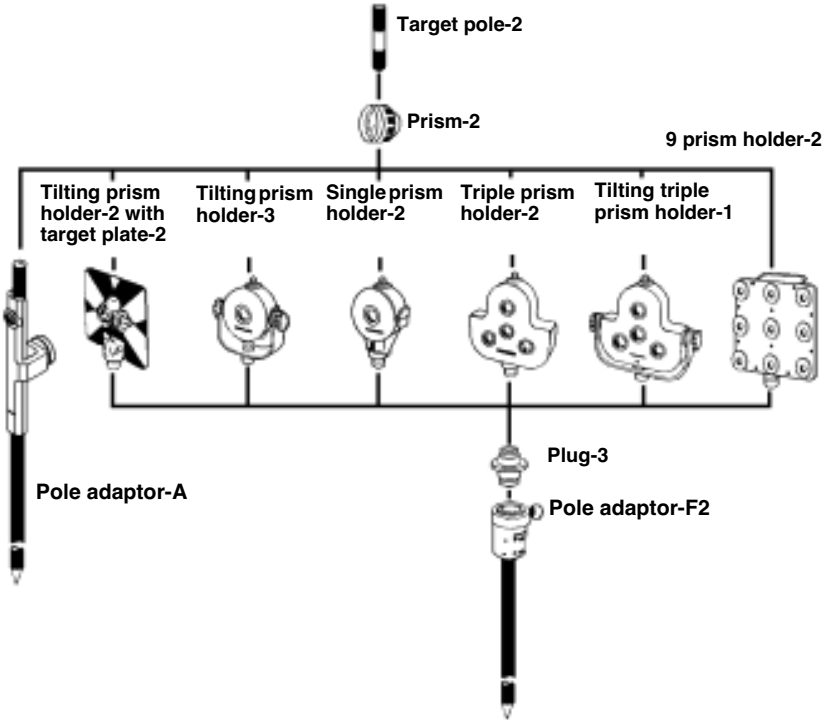
System / Prism System

System

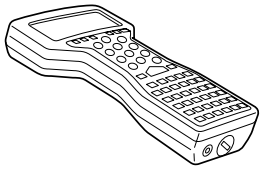


Prism System

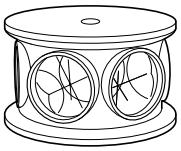




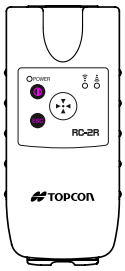
SPECIAL ACCESSORIES\



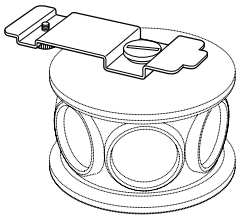
Data Collector
Suitable for systemization of measuring instrument. Measuring data will be automatically stored and transferred to a computer system, making measuring operations more efficient and saving time and effort in such operation.



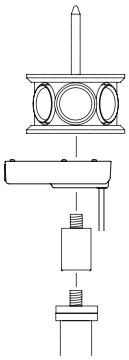
Prism unit-A3/A3S



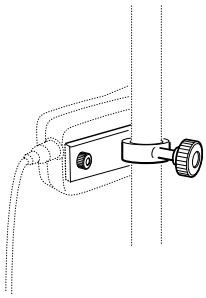
RC-2R



Holder for prism unit A3/A3S



External detecter



Holder for DM pole

PRECAUTION

- Always clean the instrument after use.

Remove the dust using a brush, then wipe off with a soft cloth.
For cleaning the lens surface of the receiving window, use a cleaning brush, then use a clean lintless cotton cloth. Moisten it with alcohol (or mixture with ether) to wipe gently in a rotational motion from the center out.

- To remove the dust on the surface of emitting window or the parts made by plastic, never use thinner or benzine. Use a clean cloth moistened with neutral detergent.

- Always make sure the instrument is completely dry before storing. Dry any moisture with a soft, clean cloth.

SPECIFICATIONS

Operating temperature	:	-20 °C to +50° C
Storing temperature	:	-30° C to +60° C
Wether proof	:	RC-2R: IPX 5 RC-2H: IPX 4
Operating distance * 1)	:	5m (when using with the external detector) - 250 m (16.4ft - 820 ft)
* 1)		* The operating distance may be shorter than normal in such the condition is not good by the heat simmer or strong direct sun shine to the detector.
Turn-round operating time	:	Approximately 10 to 12 seconds *2,3)
Optical communicating time	:	Approximately 3 to 4 seconds *2,4)
* 2)		Sight haze with visibility about 20km (12.5 miles) moderate sunlight with light shimmer.
* 3)		Under normal weather conditions, with the telescope turned 90° relative to the prism, and turn-around performed with the prism roughly aligned vertical. (refer to “Reference : Turnround motions:” on page 17.)
* 4)		Standard times for data display and data recording. Times may vary depending on software version.
Remote controller Handle Unit RC-2H		
Power source	:	DC 7.2V from GTS-800A
Detective range	:	Horizontal : 360° Vertical : ±30°
Weight	:	0.4 kg
Dimensions	:	86(D) X 180(W) X 78(H) mm
Remote controller RC-2R		
Power supply	:	Four AA size dry cells (6V)
Operating time : Normal use *1)	:	Approx. 30 hours (using with alkaline manganese dry batteries)
Pole	:	DM pole
Weight	:	0.3 kg
Dimensions	:	154 (D) X 69(W) X 38(H)
*1) Normal use		Under normal temperature at +25°C, Measuring two points (Including communicating and recording data) every 1 minute and using turn-around function once every 10 minutes. When using with the external detector, the operating time will be shortened about 30%. In low temperature, operating time will decrease rapidly due to the characteristic of dry battery. We recommend you Ni-MH battery sold in the market for low temperature.

[Emitting Laser]
Angle of Laser : Each direction ±5
°

At greater distances, the laser light at the edge of the emitting range (angle) will be weaker by laser emitting characteristic.

100m (328ft): Approximately ±5°
250m (820ft): Approximately ±3°

[Detecting Laser]
Detecting range : Horizontal ±35 °
Vertical ±35°

[Interface]
Connector with 6 pins : RS-232C
Baudrate : 4800 Bit length : 8 bits Parity bit : None
Stop bit : 1 bit

REMOTE CONTROL SYSTEM 2

RC-2

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